UNIVERSITI SAINS MALAYSIA

2nd. Semester Examination
2004/2005 Academic Session

March 2004

EAH 422/4 – Water Resources Engineering

Duration : 3 hours

Instructions to candidates:

1. Ensure that this paper contains **FIVE (5)** printed pages.

2. This paper contains **FIVE (5)** questions. Answer **FOUR (4)** questions only. Marks will be given to the **FIRST FOUR (4)** questions put in order on the answer script and **NOT** the **BEST FOUR (4).**

3. All questions **CAN BE** answered in English or Bahasa Malaysia or combination of both languages.

4. Each question carry equal marks.

5. All question **MUST BE** answered on a new sheet.

6. Write the answered question numbers on the cover sheet of the answer script.

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1. (a) Describe **FIVE (5)** types of OSD (on-site detention) facility for water quantity control.

(5 marks)

(b) Describe **FIVE (5)** characteristics which differentiate between OSD (on-site detention) facility and community pond for water quantity control.

(5 marks)

(c) An area with 6770 m^2 will be developed with 33 units of medium cost terrace house. The data for pre-development and post development discharges (5 year ARI) and critical storm (10 year ARI) for the whole development area of 6770 m^2 are given in the table below. Determine the volume of OSD perunit terrace house which is required for water quantity control.

Q_a	Q_p	t_c	t_{cs}	Q_d	t_d
112 l/s	81 l/s	40 min	10 min	201.5 l/s	20 min

$$PSD = \frac{a - \sqrt{a^2 - 4b}}{2}$$

$$a = 4\left(\frac{Q_a}{t_c}\right)\left(0.333t_c\frac{Q_p}{Q_a} + 0.75t_c + 0.25t_{cs}\right)$$

$$b = 4Q_aQ_p$$

$$SSR = 0.06t_d(Q_d - c - d)$$

$$c = 0.875PSD\left(1 - 0.459\frac{PSD}{Q_d}\right)$$

$$d = 0.214\frac{PSD^2}{Q_d}$$

(15 marks)

2. (a) Describe the typical design for outlet structure of a community pond to fulfill the criteria of water quantity control for minor and major storm events.

(5 marks)

(b) Describe **THREE (3)** hydrologic analyses for the design of community detention pond.

(5 marks)

(c) The peak discharges for pre-development and post-development conditions for the 30 min and 60 min storm durations of the development area are given in the table below. Assuming that the flow can be represented by triangular hydrograph given below, determine the preliminary estimate of the detention pond volume (V_S) for storm with 30 min and 60 min durations.

	Pre-Development		Post-Development	
Storm Duration	tc = 30 min	tc = 60 min	tc = 30 min	tc = 60 min
Peak Flow (Qp)	30 m^3/s	27 m^3/s	55 m^3/s	53 m^3/s

(15 markah)

$$V_S = 1.291 V_i \left(1 - \frac{Q_o}{Q_i}\right)^{0.753} \left(\frac{t_i}{t_p}\right)^{-0.411}$$